Vigyan Samachar: MoES News
21/08/2020

Indian scientists developed a new tool for better environmental remediation

Keywords: RemeDB, Bioremediation, Improve ecosystem, Pollutant degrading enzyme database, NIOT

The global population is continuing to rise at an unprecedented rate with the present estimate suggesting more than 9 billion people in 2050. With the growing need of this ever increasing population industrialization has become inevitable. But this global industrial revolution has at the same time contributed to polluting the environment by producing highly toxic chemicals and biological wastes in bulk.

For the control of environmental pollutions, the National Institute of Ocean Technology (NIOT) has successfully developed an eco-friendly innovative bioremediation tool (RemeDB) to identify novel remediation-related enzymes from metagenomic data sets. RemeDB would help reducing and removing the pollution and increasing the prospect of providing clean water, air and healthy soil for the future generations.

Bioremediation is a technique to decontaminate the polluted sites either aquatic or terrestrial, in an effective manner without generating secondary waste and involves naturally occurring organisms to break down or neutralize inorganic and organic pollutants into less toxic or nontoxic forms.

NIOT, researchers have developed a pollutant degrading enzyme (PDEs) database, consisting of more than 30,000 enzyme sequences to degrade major pollutants such as hydrocarbons, dyes, and plastics. Scientists said that a new database, providing the scope of identifying novel enzyme sequences, which would help to control our pollution through the biological degradation of pollutants into non-toxic substances.

According to NIOT scientists, next-generation sequencing techniques and metagenomics have provided an incentive to explore environmental microbes for a potentially novel bioremediation enzyme. Metagenomics is the study of genetic material (total genomic DNA) recovered directly from environmental samples such as soil, seawater, and desert, without culturing microbes in the laboratory.

NIOT scientists used *in silico* (computer simulation in reference to biological experiments) approach to develop the RemeDB tool containing a total of 30,925 enzyme sequences of PDEs derived from Uniprot database, including 14,442 sequences belonging to the major enzyme class of hydrocarbon degradation, 3411 sequences for dye degradation, and 1,308 sequences involved in plastic degradation. Further de-replication was carried out using python scripts to avoid sequence duplication. The final data set in RemeDB now have 21,892 sequences that remained after preprocessing. Scientists promised that the RemeDB tool is a very useful and attractive option for removing, cleaning, and managing to solve the polluted environment through microbial activity.

Led by Dr. Dharani Gopal of Marine Biotechnology Division, Ocean Science and Technology for Islands Group, NIOT, Ministry of Earth Sciences (MoES), Government of India, the research team comprised of Sai H. Sankara Subramanian, Karpaga Raja Sundari Balachandran, and Vijaya Raghavan Rangamaran at NIOT. Their research paper has been recently published in the Journal of Computational Biology.

VS/MoES/MFA/21.08.2020